

REMARKS

STATUS OF CLAIMS

Claims 9, 14, 44, 48, 54, and 58 have been cancelled herein

Claims 3-6, 13, and 16-39 were previously cancelled by prior amendments.

Claims 1, 2, 7, 8, 10, 11, 15, 40-43, 45-46, 49-53, 55-56, and 59 have been amended.

Claims 60-68 have been added.

No claims have been withdrawn.

Claims 1, 2, 7, 8, 10-12, 15, 40-43, 45-47, 49-53, 55-57, and 59-68 are currently pending in the application.

SUMMARY OF THE REJECTIONS

Claims 2, 7, 8, and 40 have been rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite. Claims 1-2, 7-10, 14-15, 40-45, 48-55, and 58-59 have been rejected under 35 U.S.C. § 102(e) as allegedly anticipated by U.S. Patent Number 6,421,711 issued to Blumenau et al. ("Blumenau"). Claims 11-12, 46-47, and 56-57 have been rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over *Blumenau* in view of U.S. Patent Number 6,620,109 issued to Ofer et al. ("Ofer"). The rejections are respectfully traversed.

RESPONSE TO THE REJECTIONS NOT BASED ON THE PRIOR ART

Claims 2, 7, 8, and 40 have been rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Office Action States that "Claim 2 recites the limitation 'the configuring steps' in line 2. There is insufficient antecedent basis for this limitation in the claim." Claim 2 is amended above to remove reference to "the configuring steps" and instead refer to both "the control processor configuring the gateway device" and "the control processor configuring the one or more storage units." Likewise, the same change has been made to computer-readable medium Claim 41, and a similar change has been made to apparatus Claim 51.

The Office Action states that “Claim 7 recites the limitation ‘the associating step’ in line 6. There is insufficient antecedent basis for this limitation in the claim. This could refer to the steps of claim 7 or claim 1.” Claim 7 is amended above feature “the control processor associating step one or more logical units from among the one or storage units to the host processor.” Likewise, the same change has been made to computer-readable medium Claim 42, and a similar change has been made to apparatus Claim 52. Finally, similar changes are made above to Claims 10, 11, 45, 46, 55, and 56.

The Office Action states that “Claim 8 is rejected … as being indefinite … [because it] is unclear how the control processor can receive the request in claim 1 and then generate the same request in claim 8.” Claim 8 is amended above to clarify that the “request” in Claim 1 is “a first request” and that the “request” in Claim 8 is “a second request.” Likewise, the same change has been made to computer-readable medium Claim 43, and a similar change has been made to apparatus Claim 53.

The Office Action states that “Claim 40 recites the limitation ‘the control processor in line 5. There is insufficient antecedent basis for this limitation in the claim.’” Claim 40 is amended above to recite “a control processor” on line 5.

The Applicant respectfully submits that the amendments to Claims 2, 7, 8, and 40 traverses the rejections of Claims 2, 7, 8, and 40 under 35 U.S.C. § 112, second paragraph.

RESPONSE TO THE REJECTIONS BASED ON THE PRIOR ART

A. CLAIM 1

(1) INTRODUCTION TO CLAIM 1

As amended above, Claim 1 features:

“A computer-implemented method of allocating storage to a host processor, comprising:
a control processor receiving a request to allocate storage to the host processor; and
the control processor associating one or more logical units from among one or more
storage units to the host processor by:
the control processor configuring a gateway device to map the one or more
logical units to the host processor;

the control processor configuring the one or more storage units to give the host processor access to the one or more logical units;
wherein the ***host processor does not determine which one or more logical units are associated with the host processor.***” (Emphasis added.)

Thus, Claim 1 features that the “control processor” does **not determine** which of the one or more logical units are associated with the host processor. The changes to Claim 1 are fully supported by the specification, and no new matter is added. For example, the Application explains with reference to Figure 3 that the virtual storage layer 310 provides “storage virtualization from the perspective of hosts 302A...**Each such host can obtain storage** through virtual storage layer 310 without determining or knowing which specific storage unit 304A, 304B, 304N, etc., is provide the storage, and **without determining** or knowing **which LUN, block, volume, concatenated, or other sub-unit of a storage unit actually contains data...**” that is used by the host processor. (Application, page 24, lines 20-24; Figure 3.)

Note that this portion of the Application also supports newly added method Claims 60 and 61, in addition to newly added computer-readable medium Claims 63 and 64 and newly added apparatus Claims 66 and 67 that include the same or similar features to method Claims 60 and 61.

The reason that the host processor does not determine or even does not know about the logical unit or LUN that the host uses is explained in the Application, such as with reference to Figures 2A and 2C. Specifically, the storage area network gateway 210 receives logical unit numbers in block 230, and then the storage area network gateway 210 creates an internal mapping of the gateway’s SCSI ports to the logical unit numbers (LUNs). As a result, the gateway 210 can properly direct information storage and retrieval requests that arrive on the gateway’s SCSI ports to the correct disk array and logical unit within a subsystem, based on the automatic allocation or assignment of storage to a particular CPU. (Application, page 22, lines 13-20.)

Similarly, the Application later explains that “control processor 312 can command storage gateways 306 and storage area networks 308 to associate a particular LUN of one or

more of the storage units 304A, 304B, 304N, etc. with a particular virtual server farm, e.g., to a particular host 302A, 302B, 302N.” (Application, page 24, lines 11-19.) As a result, “virtual storage layer 310 provides storage virtualization from the perspective of hosts 302A, etc. Each such host can obtain storage through virtual storage layer 310...without determining or knowing which LUN...of a storage unit actually contains data” for the hosts. (Application, page 24, lines 20-24.)

The Applicant notes that this additional feature of Claim 1 is in the form of a “negative limitation” and is proper as described in MPEP §2173.05(i). Specifically, that section of the MPEP explains that despite some “older cases [that] were critical of negative limitations because they tended to define the invention in terms of what it was not, rather than pointing out the invention,” the “current view of the courts is that there is nothing inherently ambiguous or uncertain about a negative limitation.” MPEP §2173.05(i) then states that any negative limitation must have basis in the original disclosure, which is the case herein regarding Claim 1 and the other claims with the same or similar features, as noted above in the explanation of support for these claim amendments and newly added claims.

(2) INTRODUCTORY DISCUSSION OF *BLUMENAU*

In contrast to the approach of Claim 1, *Blumenau* discloses an approach for modifying a storage unit referred to as a “cached storage subsystem” to allow for the use of virtual ports by hosts to access storage within the cached storage subsystem. Specifically, the cached storage subsystem 20 includes a storage controller 27 that further includes port adapters 35, 36 that are programmed to provide a plurality of virtual ports and a virtual switch, both of which are defined by software, for routing storage access requests from a physical port of the storage controller to the virtual ports. (Abstract; Figures 1, 21, and 22.) To partition the storage of cached storage subsystem among different hosts, the virtual ports are assigned to each host and the storage volumes associated with each virtual port are made accessible from each host. (Abstract.)

Note that in the approach of *Blumenau*, even with the use of the virtual ports/virtual switch, the host always must know the LUNs that the host can access. For example, the host either reads the configuration information for the volumes accessible to the host that is stored

on either the host or on the storage subsystem. (Col. 31, lines 15-17.) Specifically, *Blumenau* explains that the host can read the primary copy of the configuration information in the “gatekeeper” volume in the storage subsystem (Col. 32, lines 18-20), or the host uses a mapping driver at power up to send commands to the adapter ports to obtain the LUN information. (Col. 32, lines 22-28.) Either way, “the host must be programmed to seek out the LUNs that it can access” (Col. 32, lines 20-22), which means that the host in *Blumenau*’s approach always determines which LUNs the host can access.

(3) INTRODUCTORY ISSUES REGARDING THE OFFICE ACTION’S CITATIONS FROM *BLUMENAU*

In the rejections of the claims based on *Blumenau*, the latest Office Action does explicitly state in the Response to Arguments section that the gatekeeper facility of *Blumenau* acts as the “control processor” of the claims. The Applicant appreciates this clarification in the basis for the rejections of the claims in the latest Office Action.

However, the Applicant still fails to see an explicit statement about that the Office Action finds in *Blumenau* that corresponds to the “gateway device” in the claims. While the Applicant stated in the previous response that it appeared to the Applicant that the “gatekeeper” in *Blumenau* was being relied upon by the Office Action as corresponding to the “gateway device” of the claims, that obviously is not the case because the Office Action now states that the “gatekeeper facility” corresponds to the “control processor” of the claims.

Thus, it is still not entirely clear what the Office Action is relying upon as corresponding to the “gateway device” and the “plurality of storage gateways” of the claims. Given that *Blumenau*’s “gatekeeper facility” is being taken as the “control processor” of the claims, it appears to the Applicant that the Office Action is now based on *Blumenau*’s “storage adapter(s)” corresponding to the “gateway device” and the “plurality of storage gateways” of the claims. As before, the Applicant respectfully requests that the next communication from the Office specify what feature(s) disclosed in *Blumenau* are being taken to show “gateway device” and the “plurality of storage gateways” of the claims, particularly if the Office Action is based on equating the “gateway device” and the “plurality of storage gateways” of the claims to something other than the “storage adapter(s)” in *Blumenau*.

(4) SUMMARY OF THE DISCUSSION OF THE OFFICE ACTION'S CITATIONS FROM *BLUMENAU*

To summarize the following arguments, the approach of Claim 1 features that “*the host processor does not determine which one or more logical units are associated with the host processor,*” whereas in the approach of *Blumenau*, “*the host must be programmed to seek out the LUNs that is can access.*” (Col. 32, lines 20-22; emphasis added.) Thus, the approach of Claim 1 is fundamentally different than the approach of *Blumenau* because in Claim 1 the host processor does not determine the logical units that are associated with the host processor by the control processor, whereas with *Blumenau*, the host must always determine which LUNs the host can access.

(5) DETAILED DISCUSSION OF THE OFFICE ACTION'S CITATIONS FROM *BLUMENAU*

In the rejection of Claim 1 and other claims, the Office Action makes repeated citations to Columns 9, 31-34, and Figures 1-4 of *Blumenau*. However, the Applicant has been unable to identify either in those portions or elsewhere of *Blumenau* that the host does not determine the logical units that are associated with the host processor, as in Claim 1. Rather, *Blumenau* states exactly the opposite, namely that states “*the host must be programmed to seek out the LUNs that is can access.*” (Col. 32, lines 20-22; emphasis added.)

Specifically, in Columns 31, 32, and the first portion of 33, *Blumenau* describes the “host involvement in volume configuration and mapping.” (Col. 31, lines 7-8.) First, *Blumenau* explains that “the configuration information for the volumes accessible to a host is kept in the storage subsystem and on the host. The host should be able to access the primary copy on the storage subsystem if the host’s local copy is not available.” (Col. 31, lines 19.) For example, “the configuration information is stored in a predefined logical volume, such as a volume accessed at LUN0, that functions as a gatekeeper device.” (Col. 31, lines 23-26.)

Blumenau also explains that even with the use of the “virtual ports” described therein and that are the focus of that reference, the virtual ports are reported to the host along with the LUNS available to the host from each virtual port, both of which are programmed into each of the port adapters that implement the virtual ports. (Col. 32, lines 13-18.) However, *Blumenau* then explains an alternative in which instead of the hosts determining the LUNs via such

routines, the host can read the primary copy of the configuration information stored in the “gatekeeper” volume of the storage subsystem. (Col. 32, lines 18-20.)

Then *Blumenau* states: “***In any case, the host must be programmed to seek out the LUNs that it can access,***” either by a mapping driver at startup that includes commands to obtain the LUN information from the adapter ports or by reading the primary copy of the configuration information in the storage subsystem. (Col. 32, lines 20-31; emphasis added.) Therefore, *Blumenau* not only fails to disclose that “the ***host processor does not determine which one or more logical units are associated with the host processor,***” as in the approach of Claim 1, but *Blumenau* expressly teaches away from such a feature by stating that the host must seek out (or determine) the LUNs that the host can access.

The other portions of *Blumenau* mentioned above are consistent with Columns 31 and 32. Specifically in Columns 33 and 34, *Blumenau* explains how the host request logical volumes. (Col. 33, lines 27-28.) In particular, *Blumenau* describes the “mount” and “unmount” commands that are issued by the host controller to the port adapters, and each of these commands the LUNs. (Col. 33, lines 29-52.) The gatekeeper facility then responds to these commands and creates entries for the required mappings, which are reflected in the configuration information stored at the host and on the gatekeeper volume of the storage subsystem, either of which are accessed by the host controller, as described above. (Col. 33, line 53 – Col. 34, line 10.)

Likewise, in Column 9, *Blumenau* describes how the host obtains the LUN information. Specifically, *Blumenau* explains that the mapping of LUNs and logical volumes are “specified by or reported to a host,” such as through a “Report LUNs” command that is typically executed by the operating system of the host at “boot” time. “(Col. 9, lines 18-43.)

(6) CONCLUSION OF DISCUSSION OF CLAIM 1 AND *BLUMENAU*

Because *Blumenau* fails to disclose, teach, suggest, or in any way render obvious that “the ***host processor does not determine which one or more logical units are associated with the host processor,***” and furthermore because *Blumenau* expressly teaches away from such a feature when *Blumenau* states “the ***host must be programmed to seek out the LUNs that is can access***” (Col. 32, lines 20-22; emphasis added), the Applicant respectfully submits that,

for at least the reasons stated above, Claim 1 is allowable over the art of record and is in condition for allowance.

C. CLAIMS 40 AND 50

Claims 40 and 50 contain features that are the same as those described above with respect to Claim 1, and in particular both Claims 40 and 50 feature “*the host processor does not determine which one or more logical units are associated with the host processor,*” which is the same as in Claim 1. Therefore, based on at least the reasons stated above with respect to Claim 1, the Applicant respectfully submits that Claims 40 and 50 are allowable over the art of record and are in condition for allowance.

D. CLAIMS 2, 7, 8, 10-12, 15, 41-43, 45-47, 49, 51-53, 55-57, AND 59-68

Claims 2, 7, 8, 10-12, 15 and 60-62 are dependent upon Claim 1, Claims 41-43, 45-47, 49, and 63-65 are dependent upon Claim 40, and Claims 51-53, 55-57, 59, and 66-68 are dependent upon Claim 50, and thus include each and every feature of the corresponding independent claims. Therefore, the Applicant respectfully submits that each of Claims 2, 7, 8, 10-12, 15, 41-43, 45-47, 49, 51-53, 55-57, and 59-68 is allowable for the reasons given above for Claims 1, 40, and 50. In addition, each of Claims 2, 7-12, 14-15, and 41-59 introduces one or more additional limitations that independently render it patentable. However, due to the fundamental differences already identified, to expedite the positive resolution of this case a separate discussion of those limitations is not included at this time, with the exception of a small number of dependent claims that are addressed below. Therefore, it is respectfully submitted that Claims 2, 7, 8, 10-12, 15, 41-43, 45-47, 49, 51-53, 55-57, and 59-68 are allowable for the reasons given above with respect to Claims 1, 40, and 50.

(1) CLAIMS 10, 45, AND 55

Claim 10 features “*the request to allocate storage specifies a first amount of storage*” and “*the control processor identifying the one or more logical units (LUNs) of the one or more storage units that, when combined, have a second amount of storage that is at least as great as the first amount of storage specified in the request,*” while Claims 45 and 55 contain the same or very similar features. The changes to Claim 1 are fully supported by the specification, and

no new matter is added. For example, the Application explains with respect to Figure 2C that in block 222, a database query is used to identify an amount of storage sufficient to satisfy a request for increased storage, such as a disk tag that specifies 30 Mb of disk storage, and that records of free volumes that add up to 30 Mb or more of storage is retrieved from the database. (Application, page 21, lines 20-24.) When the database result is received, the command to request that amount of storage is created, such as in block 224 where a metavolume command is used to obtain the particular amount of storage that can satisfy what is requested in the disk tag. (Application, page 22, lines 1-5.)

In the rejection of Claim 10, the Office Action states that *Blumenau* discloses “the control processor identifying the one or more logical units (LUNs) of the one or more storage units that have a sufficient amount of storage to satisfy the request (at least col. 32 line 13 – col. 34 line 59; col. 9, lines 44-57).” In rejection a similar feature of Claim 15, the Office Action states that *Blumenau* discloses “wherein the request to allocate storage specifies a parameter selected from the group consisting of an amount of storage to be allocated and a type of storage to be allocated (at least col. 31 line 9 – col. 32 line 12; col. 6 line 64 – col. 7 line 65; col. 9, lines 44-57; col. 32, lines 58-67; col. 34, lines 2-17).”

Claim 10 is amended to feature both a “first amount of storage” in the request and a “second amount of storage” that is provided by the storage units such that the latter is at least as great as the former. For example, as noted above in the example from the Application, if the request is for 30 Mb of storage, the system provides the logical unit or units that provide at least 30 Mb of storage.

However, the Applicant has been unable to find in any of the many cited portions of *Blumenau* noted above or elsewhere the ability of a host in *Blumenau* to specify an amount of storage and then have the storage system identify the logical units that provide at least such storage as part of allocating storage for the hosts. In particular, *Blumenau* describes that the host controller can use the “mount” and “unmount” commands that identify the LUNs to be mounted or unmounted (Col. 33, line 28 – Col. 34, line 10). But the request to mount or unmount one or more LUNs that are specifically identified is not the same as requesting an amount of storage without specifying the specific LUNs. This highlights the fundamental difference with *Blumenau* noted above that in the approach of the claims of the application,

the host processor does not determine the logical units that are associated with the host processor, whereas in *Blumenau*, the host must know what the LUNs are.

The other cited portions of *Blumenau*, namely in Columns 6, 7, 9, 31, and 32, also fail to describe a request for an amount of storage and then storage having at least that amount being associated with the host controller. Rather, the discussion of those columns is consistent with that of Columns 33 and 34 above, namely that the host controller knows the LUNs and requests storage via the specification of the LUNs themselves and not by specifying an amount of storage as in Claims 10, 45, and 55.

Because *Blumenau* fails to disclose, teach, suggest, or in any way render obvious that “the request to allocate storage specifies a first amount of storage” and “the control processor identifying the one or more logical units (LUNs) of the one or more storage units that, when combined, have a second amount of storage that is at least as great as the first amount of storage specified in the request,” the Applicant respectfully submits that, for at least the reasons stated above, Claims 10, 45, and 55 are allowable over the art of record and is in condition for allowance.

(2) CLAIMS 60-61, 63-64, AND 66-67

Claims 60, 63, and 66 each feature that “the host processor does not know which one or more logical units are associated with the host processor,” as compared to Claims 1, 40, and 50 that each feature that “the host processor does not determine which one or more logical units are associated with the host processor.” Thus, in Claims 60, 63, and 66, even if the host processor does not determine the logical units that are associated with the host processor (e.g., that another entity makes that determination), the host processor still does not even “know” which logical units are associated with the host processor (assuming that the logical units are determined by an entity other than the host processor).

Similarly, Claims 61, 64, and 67 each feature that “the host processor does not know the one or more LUNs for the one or more logical units that are associated with the host processor,” which is similar to yet more specific that Claims 60, 63, and 66 by referring to the LUNs themselves. As noted above with respect to Claim 1, the same portions of the Application that support the changes to Claims 1, 40, and 50 also fully support new Claims 60-61, 62-63, and 65-66, and therefore no new matter is added.

The same explanation for why *Blumenau* does not disclose that the host processor does not determine the logical units that are associated with the host processor also explains why *Blumenau* does not disclose that the host processor neither knows the logical units or the LUNs that are associated with the host processor.

(3) CLAIMS 62, 65, AND 68

Finally, Claims 62, 65, and 68 each feature two host processors, two logical units, two storage units, and steps that, when taken with their respective independent claims, describe the association of a second storage unit with the first processor, then associating of the second storage unit with the second processor instead of the first processor, and then again associating the second storage unit back from the second processor to the first processor, all without either the first host processor or the second host processor determining the logical units assigned to each of the two host processors.

Claims 62, 65, and 68 are fully supported by the Application as filed, and now new matter is added. For example, the Application explains that Figure 3A illustrates an “embodiment of an approach for dynamically associating computer storage with hosts using a virtual storage layer. In general, a virtual storage layer provides a way to dynamically and selectively associate storage, including boot disks and shared storage, with hosts as the hosts join and leave virtual server farms, without adversely affecting host elements such as the operating system and applications, and without host involvement.” (Application, page 23, lines 1-6.) Also, as explained with reference to Figure 7, the state of a disk unit can change from “free” to “mapped” and then back to “free” again for allocation to the same or a different host. (Application, Figure 7, pages 37-39.)

Thus, Claims 62, 65, and 68 are an example of how, through the use of the “virtual storage layer” approach of Claims 1, 40, and 50, individual logical units and their associated physical storage on the storage units can be assigned and reassigned between different host processors. Again, as noted above, this is possible in part as a result of the host processors not determining, or even knowing, which logical units or even the LUNs are associated with those host processors.

CONCLUSION

The Applicant believes that all issues raised in the Office Action have been addressed and that allowance of the pending claims is appropriate. After entry of the amendments, further examination on the merits is respectfully requested.

The Examiner is respectfully requested to contact the undersigned by telephone if it is believed that such contact would further the examination of the present application.

For the reasons set forth above, it is respectfully submitted that all of the pending claims are now in condition for allowance. Therefore, the issuance of a formal Notice of Allowance is believed next in order, and that action is most earnestly solicited.

To the extent necessary to make this reply timely filed, the Applicant petitions for an extension of time under 37 C.F.R. § 1.136.

If any applicable fee is missing or insufficient, throughout the pendency of this application, the Commissioner is hereby authorized to any applicable fees and to credit any overpayments to our Deposit Account No. 50-1302.

Respectfully submitted,

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on March 29, 2006 by Tracy Reynolds
Tracy Reynolds